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the New World, omitting mention of this long unnoticed instrument (not yet described in duplicate, to my knowledge, anywhere else in the world), are unsatisfactory. The specimens attesting the interesting process, in the possession of the museum of the University of Pennsylvania, since 1895, cannot be ignored.

H. C. MERCER.

INDIAN HOUSE, May 23, 1897.

THE SIGNIFICANCE OF INTERNAL SECRETION.

THE communication on the above subject published in *SCIENCE* for April 30th, by Mr. Albert Mathews, seems to me not only of interest, but of importance, because it indicates in a comprehensive way some of the directions in which our thoughts may move just now to advantage. Views not wholly unlike these of Mr. Mathews are hinted at in my 'Animal Physiology' (1889); but it has been especially in lectures to my most advanced class in physiology that, for ten years, I have been accustomed to insist on the bearing of the function of one part on that of another—a subject generally neglected in the books—and also the relation of the development of one tissue or organ as determined by another. Necessarily it was impossible, till more recent discoveries had been made, to indicate many of the ways in which this is brought about, and even yet we can do so but vaguely.

It was very natural, therefore, for me to hasten to read Mr. Mathews' communication to my class and to enforce its teaching by comparison with similar expressions of opinion in a paper entitled 'Experimental Cachexia Strumipriva,' published in the *Canadian Practitioner* in October (?) 1895. I venture to think that Mr. Mathews will find in this paper views as broad as his own, if not more so. To quote a single sentence: "No cell is so small, so distant from others, but that in some way it makes itself felt, and this is to me the most important lesson of all this recent development in physiology and medicine growing out of the study of the total or partial extirpation of organs, of transplantation, of feeding of glands, etc." The extension of the principle of the influence of the internal secretion to plants is admirable, in my opinion, and in this I am inclined to believe that Mr.

Mathews is entirely original. However, while Mr. Mathews' views are broad they are apt, if taken alone, to lead to narrowness by their very exclusiveness. When he seeks to explain the co-ordinated life of plants in this way does he also remember the *protoplasmic continuum*, and when he would explain by internal secretion the co-ordination in movement, say, of one cell with another in simple invertebrates does he bear in mind the possibility of explanation through *molecular impact*? Life implies ceaseless molecular movement. Just now we are witnessing, in the medical world, the most remarkable development of chemical conceptions to explain pathological conditions that has yet taken place, but, as usual, with a narrowness that is evidence of the evil effects as well as the advantages of specialization. The doctrine of 'pangens' has always seemed to me a crude and unnecessary hypothesis, and I cannot believe that internal secretion *alone* will supply an adequate substitute, though it will assist to a better understanding of certain results in detail.

Nearly ten years ago I put forward a view in a paper entitled 'A Physiological Basis for an Improved Cardiac Pathology' (*Medical Record*, October 22, 1887), which, so far as I know, was then set forth for the first time in print, though it had been earlier taught in my lectures. This conception was more fully elaborated in 'The Influence of the Nervous System on Cell Life.' (*New York Medical Journal*, December 22, 1888.)

I endeavored to show that we were justified in holding that the nervous system exercised a *constant influence* over all cells, tissues and organs, either directly or indirectly, in every animal provided with such a system, this influence being the more important the higher the animal in the scale of existence. This theory of the constant influence of the nervous system over metabolism, etc., has, so far as I am aware, not been recognized or, at all events, taught by anyone except myself, till it was prominently brought forward last October by Professor M. Foster, the well-known physiologist, in his admirable Huxley lecture. It has since been publicly espoused by the distinguished neurologist Gowers, and will, I have no doubt, shortly receive the recognition which I have long felt it deserved.

To me this is a far more important single concept than any other to explain co-ordination of all kinds, even the continuance of the healthy life of cells in higher animals, unless it be that of the influence of protoplasm on protoplasm, *per se*, and directly. Nevertheless, this doctrine of the influence of one cell on another, through chemical agency, which the theory of the constant effect of the nervous system renders clearer for all higher animals, is one that is also indispensable and which we are now beginning to understand in more detail. The main purpose of this communication is to put forward as broad a basis as possible for conceptions of the nature of living things, for the exact demonstration of which in a way to satisfy a rigid logic we must still wait, it may be long, but which we cannot afford, in the meantime, to ignore without making many errors and unduly restricting the field of view.

WESLEY MILLS.

MCGILL UNIVERSITY,
MONTREAL, May 13, 1897.

HIGHHOLE COURTSHIP.

SOME mornings since I observed two highholes on the same branch evidently in courtship. The male, as I took it, would give a few clucks, and rapidly bob its head up and down four or five times describing about a quarter of a circle, and the female then responded with the few clucks and corresponding motions. This was repeated at short intervals, and they flew to another tree, and continued this rather comical performance. Mr. Burroughs, in describing this courtship of the highhole, speaks of the female as 'unmoved,' which, however, was plainly not so in this case. As the meaning of the head bobbing I would suggest that the motion, being much the same as when pecking at a tree or in the turf, may signify the offering of food. The male says, "Come with me and I will find you lots of fat grubs," and the female assents by the same acts and signifies mutuality. The whole is in the same line of sentiment and action as that of the young man who offers his best girl ice cream and soda water. I may also mention that I have often noticed this spring what I supposed to be the male blue jay approach his mate with a cluck and transfer to her bill some article of food, the whole affair appearing to be

gallantry. It may even be that the kiss is a survival of lip-to-lip feeding.

As to the pugnacity of birds in early spring I may mention that some seasons since I observed a cock robin fight for some hours his own reflection in a cellar window. This season a mirror was placed upon a wren's box which had been usurped by a pair of English sparrows. The female fought her reflection most furiously, but the male showed more intelligence, investigated carefully, and would retire around the tree and peer out to see if the supposed bird would move toward the nest. At nightfall he took his place before the mirror, as if on guard. A carefully conducted series of experiments with mirrors upon birds and other animals would, by providing the new environment, be of great value in testing intelligence.

HIRAM M. STANLEY.

LAKE FOREST, ILL., May 5, 1897.

A QUESTION OF CLASSIFICATION.

TO THE EDITOR OF SCIENCE: In your issue of December 18, 1896, pp. 918-922, in a communication by myself entitled 'A Question of Classification,' through a typographical error I am made to say that "all other students place the Dakota formation in the middle of our American Upper Cretaceous." The word 'Upper' should have been omitted from this sentence, as it was my intention to say that "all other students place the Dakota formation in the middle of our American Cretaceous and at the base only of the upper of the two great series into which the Cretaceous of this country is divided."

ROBT. T. HILL.

SCIENTIFIC LITERATURE.

The Materials of Construction. A Treatise for Engineers on the Strength of Engineering Materials. By J. B. JOHNSON, Professor of Civil Engineering in Washington University, St. Louis, Mo. New York, John Wiley & Sons. 1897. 8vo. Cloth. Pp. xv+787, with 9 plates. Price \$6.00.

This work is divided into four parts, the first treating of the mechanics of the subject, the second of general properties of materials, the third of methods of testing, and the fourth of results of tests. The number of pages in these